

**MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE**

**Ternopil Volodymyr Hnatiuk National Pedagogical University**

---

**EDUCATIONAL AND PROFESSIONAL PROGRAM  
015.10 Professional education (Computer technologies)**

**The second level of higher education**

**Master**

**the field of knowledge 01 Education / Pedagogy**

**015.10 Professional education (Computer technologies)**

**Qualification:** Specialist in the field of computer technologies, disciplines in the field of computer technologies

**APPROVED BY THE ACADEMIC COUNCIL**

**The Head of the Academic Council**

\_\_\_\_\_/V. P. Kravets

**(protocol №13 dated June «27» 2017)**

**Educational program enacts from September «01» 2017**

**(order №220-p dated August «30» 2017)**

**Ternopil 2017**

# 1. Profile of educational program in specialty 015.10 Professional education (Computer technologies)

| <b>1 – General information</b>                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Full name of institution of higher education and structural subdivision</b>                                                                                                                                                                                                                                                                                                            | Ternopil Volodymyr Hnatyuk National Pedagogical University<br>Engineering and pedagogical faculty<br>Department of Computer Technologies |
| <b>Degree higher education and the name of the language qualification the original</b>                                                                                                                                                                                                                                                                                                    | Master                                                                                                                                   |
| <b>Official name educational program</b>                                                                                                                                                                                                                                                                                                                                                  | Educational and professional program                                                                                                     |
| <b>Type of diploma and volume educational program</b>                                                                                                                                                                                                                                                                                                                                     | Master's degree, unitary, 90 credits ECTS, the term of study – 1,5 year                                                                  |
| <b>Availability of accreditation</b>                                                                                                                                                                                                                                                                                                                                                      | Accreditation Commission of Ukraine<br>Ukraine<br>2018 year                                                                              |
| <b>Period of accreditation</b>                                                                                                                                                                                                                                                                                                                                                            | FQ-EHEA - second cycle, EQF LLL - 7 level, NRC (NQF – National Qualification Framework) Ukraine - 7 level                                |
| <b>Cycle / Level</b>                                                                                                                                                                                                                                                                                                                                                                      | Availability of a bachelor's degree                                                                                                      |
| <b>Prerequisites</b>                                                                                                                                                                                                                                                                                                                                                                      | Ukrainian                                                                                                                                |
| <b>Language (s) of teaching</b>                                                                                                                                                                                                                                                                                                                                                           | 2023                                                                                                                                     |
| <b>The duration of the educational program</b>                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                          |
| <b>2. The purpose of the educational program</b>                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                          |
| Training of highly skilled, competitive professionals in the field of computer technology capable of solving complex specialized problems and practical problems in the field of vocational education, which involves the application of certain theories and methods of computer technology, pedagogical and other sciences and is characterized by complexity and integrity conditions. |                                                                                                                                          |
| <b>3. Characteristics of the educational program</b>                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                          |
| <b>Subject area (branch of knowledge, specialty)</b>                                                                                                                                                                                                                                                                                                                                      | 01 Education/Pedagogy<br>015.10 Professional education (Computer technologies)                                                           |
| <b>Orientation of the educational program</b>                                                                                                                                                                                                                                                                                                                                             | Educational and professional                                                                                                             |
| <b>The main focus of the educational program and specialization</b>                                                                                                                                                                                                                                                                                                                       | Formation and development of professional competence of the teacher of professional education in the field of computer technologies      |

|                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                    | as an integration activity, including pedagogical and engineering components.                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Features of the program</b>                                                                     | Interdisciplinary and multidisciplinary training of specialists                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>4 – Eligibility of graduates of the educational program for employment and further training</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Employment</b>                                                                                  | Lecturer in higher educational institutions of the I-IV level of accreditation                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Further training</b>                                                                            | Ability to study on the second level education program: Master's programs in professional education, as well as masters interdisciplinary programs that are close to computer technology education: FQ-EHEA - second cycle, EQF LLL - 7 level, NRC (NQF – National Qualification Framework) Ukraine - 7 level                                                                                                                                                                                                                  |
| <b>5 – Teaching and assessment</b>                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Teaching and studying</b>                                                                       | Student-centered, problem-oriented learning, initiative self-study. Problematic, interactive, project, informational and computer, self-developing, collective and integrative, contextual teaching technologies. Teaching methodological support and counseling of independent work is carried out through the university virtual learning environment.                                                                                                                                                                       |
| <b>Assessment</b>                                                                                  | <p><b>Types of control:</b> <i>by levels:</i> self-control, control at the level of the teacher, control at the level of the head of the department, control at the dean's level, control at the level of the administration, state control; <i>by term:</i> operational (incoming, current, intermediate, final) and delayed.</p> <p><b>Forms of control:</b> oral and written questioning; test control; presentation of scientific work; protection of laboratory, calculations, coursework; credits, exams; state exam</p> |
| <b>6 – Program competencies</b>                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Integral competency</b>                                                                         | Ability to solve complex problems and problems in the educational and industrial sectors of professional activity in accordance with the specialization, which involves research and / or innovation and characterized by uncertainty of conditions and requirements.                                                                                                                                                                                                                                                          |
| <b>General competencies</b>                                                                        | <b>GC1</b> Ability to use foreign languages in the process of professional activity in vocational                                                                                                                                                                                                                                                                                                                                                                                                                              |

|                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                   | <p>schools and at work.</p> <p><b>GC2</b> Ability to analyze the philosophical foundations of professional knowledge, observance of methodological norms and their application in the process of solving problem situations, the desire to continuously improve the educational and scientific level, actualization and implementation of their own personal potential, the desire for self-development.</p> <p><b>GC3</b> Ability to implement effective management of innovative activities in education and in production.</p> <p><b>GC4</b> Ability to design innovative technologies for training and upbringing of future specialists, depending on the goals set, developing strategic and tactical programs, introducing innovations into their own activities, and conducting their expertise.</p> <p><b>GC5</b> Ability to develop management programs by sector or educational structure, organizational and managerial conditions for implementation of projects of professional activity, further educational route in the field of management.</p> <p><b>GC6</b> Ability to develop and apply software for production or educational processes.</p> <p><b>GC7</b> Ability to develop multi-level educational projects and programs in accordance with professional requirements for a specialist in the field and initial conditions for the implementation of the educational process in a vocational school.</p> |
| <b>Professional competencies of the specialty</b> | <p><b>PC1</b> Ability to integrate into the modern professional environment.</p> <p><b>PC2</b> Ability to analyze data on the basis of visual presentation of the results of experimental studies.</p> <p><b>PC3</b> Ability to design and implement applied Web applications with modern software tools.</p> <p><b>PC4</b> Ability to create expert decision support systems using intelligent information technologies based on fuzzy logic, neural networks and genetic algorithms.</p> <p><b>PC5</b> Ability to free possession of various communicative styles: informal, official,</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

|                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                         | <p>scientific.</p> <p><b>PC6</b> Ability to protect copyright on the results of its own innovation and scientific activities in accordance with legal norms.</p> <p><b>PC7</b> Ability to analyze and substantiate spatial and temporal, logistical, financial and economic and other resources for carrying out professional activity in the educational and industrial sphere according to specialization.</p> <p><b>PC8</b> Ability to solve practical problems in developing, calculating and designing specialized computer systems for various applications.</p> <p><b>PC9</b> Ability to develop, inspect, integrate the software code and test the quality features of the software in accordance with ISO 9126.</p> <p><b>PC10</b> Ability to analyze existing problems of automation of management in the industrial or educational sectors and the application of appropriate technologies for automation of production systems management.</p> <p><b>PC11</b> Ability to use technologies and tools for designing mobile applications for modern mobile platforms.</p> <p><b>PC12</b> Ability to design and implement component software models as the basis of cross-platform.</p> <p><b>PC13</b> The ability of students to master the principles of building integrated information security systems, development, research and application of information security mechanisms.</p> <p><b>PC14</b> Ability to design and implement component models of software by means of extreme programming.</p> <p><b>PC15</b> Ability to administer and configure modern information and communication systems, taking into account the factor of information protection.</p> <p><b>PC16</b> Ability to implement effective management of innovative activities in education and in production.</p> |
| <b>7 – Program outcomes of studying</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>POS1</b>                             | Be able to apply methods and techniques of pedagogical influence on the person; use knowledge of pedagogy in teaching organization, team management; to apply psychological                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

|              |                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|              | knowledge in the organization of educational activities, to establish optimal pedagogical interaction with students.                                                                                                                                                                                                                                                                                   |
| <b>POS2</b>  | To have the technique of using pedagogical research methods in the study and implementation of effective forms and methods of teaching and education; psychological methods in the organization of educational activities and education of students.                                                                                                                                                   |
| <b>POS3</b>  | Be able to apply theoretical bases of management in practical activity; to investigate the organizational structure of management of the branch of economy, organization, firm; apply modern management techniques.                                                                                                                                                                                    |
| <b>POS4</b>  | To possess scientific management methods of educational process in vocational schools.                                                                                                                                                                                                                                                                                                                 |
| <b>POS5</b>  | To substantiate the scientific problem, to develop a methodology and plan of scientific research, to select information sources of scientific research.                                                                                                                                                                                                                                                |
| <b>POS6</b>  | To have knowledge about the essence of scientific knowledge, the analysis of science as a specific form of knowledge, spiritual production and social institute.                                                                                                                                                                                                                                       |
| <b>POS7</b>  | Be able to discuss the educational and specialization issues to reach an understanding with the interlocutor. To prepare public statements on sectoral issues, using appropriate means of verbal communication.                                                                                                                                                                                        |
| <b>POS8</b>  | Writing and translating professional texts and documents in a foreign language from a range of industry issues, demonstrating intercultural understanding and prior knowledge in a specific professional context.                                                                                                                                                                                      |
| <b>POS9</b>  | Be able to substantiate a scientific problem; to develop a methodology and a plan for scientific research; to select informational sources of scientific research; draw up the results of scientific research; to formulate working hypotheses and to define research tasks; determine the diagnostic dimensions of the studied phenomena; to carry out testing of the results of scientific research. |
| <b>POS10</b> | To possess: methods and techniques of scientific research; forms and principles of organization of research work; the methodology for creating a theoretical and empirical model of scientific research.                                                                                                                                                                                               |
| <b>POS11</b> | Analyze the software development process for quality assessment; to carry out effective and qualified inspections; use statistical methods to estimate the density of defects and the probability of failure.                                                                                                                                                                                          |
| <b>POS12</b> | Calculate the effectiveness of testing based on many criteria; use tools for automated testing; create reports based on test results.                                                                                                                                                                                                                                                                  |
| <b>POS13</b> | Be able to define an individual approach to the development of                                                                                                                                                                                                                                                                                                                                         |

|              |                                                                                                                                                                                                                                                                              |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|              | personal qualities of university students and influence their behavior by creating an appropriate educational (virtual) environment; to have modern effective methods of organizing the educational process in higher educational institutions.                              |
| <b>POS14</b> | To have pedagogical forms of educational interaction with students, skills of conducting scientific and methodical work, research and experimental forms of pedagogical activity.                                                                                            |
| <b>POS15</b> | To use automated control programs for solving applied problems of management of structural units of enterprises; apply existing basic products and configurations for solving problems and problems of complex organizational management of objects of management.           |
| <b>POS16</b> | To possess the knowledge, skills and skills of creation and application of modern computer information systems designed to provide optimal organizational management of objects of management.                                                                               |
| <b>POS17</b> | Debug and resolve conflicts in modern network services and servers; to carry out maintenance of network server technologies; monitor security of computer networks and build secure computer systems.                                                                        |
| <b>POS18</b> | Have the basic methods of administering, debugging, optimizing network services; method of monitoring the safety of computer networks and the technology of building secure computer systems.                                                                                |
| <b>POS19</b> | Develop requirements and specifications for components of information systems; design and implement software components; to design the human-machine interface of information systems; integrate components into the system; develop software components on the server side. |
| <b>POS20</b> | Be able to implement the development of software using the techniques of extreme programming.                                                                                                                                                                                |
| <b>POS21</b> | Be able to plan the content of the project, monitor the progress of the project, form the project team, use application software package for project management, in particular MS Project.                                                                                   |
| <b>POS22</b> | To have the content basis of the principles of project activity of the enterprise, technology of project management; the methodology for implementing the main functions of project management (organization, planning and control.                                          |
| <b>POS23</b> | Be able to plan the work of an Internet media resource, to create a text and visual filling of the Internet resource using modern types of infographics, social services for the work of Internet media.                                                                     |
| <b>POS24</b> | Be able to issue materials for applications for inventions (utility models), industrial designs, marks for goods and services (trademarks), objects of copyright and related rights.                                                                                         |

|              |                                                                                                                                                                                                                                                                                                  |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>POS25</b> | To have skills in work with normative legal acts, patent documentation at registration of materials of the application for the object of intellectual property.                                                                                                                                  |
| <b>POS26</b> | Be able to work with the main cryptographic systems; to build protected computer systems and networks; use cryptanalysis tools to assess the reliability and security of computer systems and networks.                                                                                          |
| <b>POS27</b> | Be able to apply technologies, design methods and tools for developing software products on modern mobile platforms, apply tools for developing mobile applications; to use software tools for the formation of basic information security procedures in mobile devices.                         |
| <b>POS28</b> | Be able to use the software to use the procedures of intellectual analysis in the processing and analysis of primary information.                                                                                                                                                                |
| <b>POS29</b> | Develop interactive fuzzy expert systems using the FIS fuzzy editor and command line mode; to investigate and compare the characteristics of neural and hybrid networks and systems based on fuzzy logic. Build control systems based on hybrid networks.                                        |
| <b>POS30</b> | Have the skills of constructing complex formulas for data processing, solve optimization problems and choose optimal decision strategies using the principles of visual display of data, and be able to predict the development of the object or process.                                        |
| <b>POS31</b> | Be able to create static graphics; work with text and graphics with multimedia tools; to develop transformational animation based on the technologies of creating animated computer graphics in order to place them on web sites.                                                                |
| <b>POS32</b> | Analyze the software development process for quality assessment; to carry out effective and qualified inspections; use statistical methods to estimate the density of defects and the probability of failure.                                                                                    |
| <b>POS33</b> | Calculate the effectiveness of testing based on many criteria; use tools for automated testing; create reports based on test results.                                                                                                                                                            |
| <b>POS34</b> | Be able to classify a specific design task, find analogues and a prototype, compile and agree a technical task on the project, choose the appropriate hardware and software design tools, use the means of verification and measure the comparative performance of the design and known results. |
| <b>POS35</b> | Own methodology and technique of construction of specialized computer systems taking into account the profile and features of the object, where it is planned to be used.                                                                                                                        |
| <b>POS36</b> | Be able to design and develop Web-based client-server systems, optimize their performance, set up work with the database, use cache, programmed with Javascript, jQuery, AJAX                                                                                                                    |
| <b>POS37</b> | Be able to design automated control systems for technological processes to ensure their efficient organization.                                                                                                                                                                                  |

|                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>POS38</b>                                            | Be able to apply basic knowledge of standards in the field of information technology in the development and implementation of distributed computing systems using digital communications in the global space.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>8 – Resource support of the program</b>              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Personnel support</b>                                | <p>Program developers: 2 Doctors of Sciences, 9 PhDs. All developers are full-time employees of the Ternopil National Pedagogical University named after Volodymyr Hnatyuk.</p> <p>Guarantor of educational program: I. M. Tsidylo – Doctor of Pedagogical Sciences., professor of computer technologies department.</p> <p>Scientific and pedagogical staff with academic degrees and / or academic degrees, as well as highly skilled specialists, are involved in the program realization. In order to increase the professional level, all scientific and pedagogical workers undergo an internship once in five years, including overseas</p>                                                                                                                                            |
| <b>Material and technical support</b>                   | <ul style="list-style-type: none"> <li>– educational buildings;</li> <li>– hostels;</li> <li>– thematic offices, specialized laboratories;</li> <li>– computer classes;</li> <li>– food items;</li> <li>– points of wireless access to the Internet;</li> <li>– multimedia equipment;</li> <li>– sports hall, sports grounds.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Information, studying and methodological support</b> | <ul style="list-style-type: none"> <li>– official site of TNPU them. V. Hnatiuk: <a href="http://tnpu.edu.ua">tnpu.edu.ua</a></li> <li>– points of wireless access to the Internet;</li> <li>– unlimited access to the Internet;</li> <li>– scientific library, reading rooms;</li> <li>– virtual learning environment Moodle (<a href="http://elr.tnpu.edu.ua">elr.tnpu.edu.ua</a>);</li> <li>– MS Office 365 package;</li> <li>– corporate mail;</li> <li>– training and work plans;</li> <li>– graphs of the educational process;</li> <li>– teaching and methodical complexes of disciplines;</li> <li>– study and work programs of disciplines;</li> <li>– didactic materials for independent and individual work of students from disciplines;</li> <li>– practice programs;</li> </ul> |

|                                                            |                                                                                                                                                                                                                                                                       |
|------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                            | <ul style="list-style-type: none"> <li>– methodical instructions on the implementation of course projects (works), master's (qualification) theses;</li> <li>– criteria for assessing the level of training;</li> <li>– packages of complex control works.</li> </ul> |
| <b>9 – Academic mobility</b>                               |                                                                                                                                                                                                                                                                       |
| <b>National Credit Mobility</b>                            | Academic mobility, realized through the credit transfer system of the organization of the educational process                                                                                                                                                         |
| <b>International Credit Mobility</b>                       | –                                                                                                                                                                                                                                                                     |
| <b>Studying of foreign applicants for higher education</b> | –                                                                                                                                                                                                                                                                     |

## 2. List of components of the educational and professional program and their logical consistency

### 2.1 . List of components

| Code/<br>№                                  | Components of the educational program (educational disciplines, term projects (papers), occupational practices, qualification work) | Credits<br>ECTS | Assessment<br>form |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------|
| 1                                           | 2                                                                                                                                   | 3               | 4                  |
| Cycle of general training                   |                                                                                                                                     |                 |                    |
| Objective components of educational program |                                                                                                                                     |                 |                    |
| OC1                                         | Psychology and pedagogy of higher education                                                                                         | 3               | Exam               |
| OC2                                         | Management in education                                                                                                             | 3               | Exam               |
| OC3                                         | Philosophy of science                                                                                                               | 3               | Exam               |
| OC4                                         | Foreign language for professional orientation                                                                                       | 3               | Credit             |
| Total amount of objective components:       |                                                                                                                                     | 12              |                    |
| Cycle of professional training              |                                                                                                                                     |                 |                    |
| Objective components of educational program |                                                                                                                                     |                 |                    |
| OC5                                         | Methodology and organization of scientific research                                                                                 | 3               | Exam               |
| OC6                                         | Technology development and testing programs                                                                                         | 6               | Exam               |
| OC7                                         | Theory and methods of vocational training                                                                                           | 3               | Exam               |
| OC8                                         | Automated systems of organizational management                                                                                      | 3               | Credit             |
| OC9                                         | System administration and security of information and communication systems                                                         | 6               | Exam               |
| Total amount of objective components:       |                                                                                                                                     | 21              |                    |
| Selective components of educational program |                                                                                                                                     |                 |                    |
| SC1                                         | Cross-platform programming                                                                                                          | 3               | Exam               |
| SC2                                         | Extreme programming                                                                                                                 | 3               | Exam               |
| SC3                                         | Project management                                                                                                                  | 3               | Credit             |
| SC4                                         | Basics of Internet media                                                                                                            | 3               | Credit             |
| SC5                                         | Intellectual Property                                                                                                               | 3               | Exam               |
| SC6                                         | Fundamentals of Information Security                                                                                                | 3               | Exam               |
| SC7                                         | Software for mobile platforms                                                                                                       | 3               | Credit             |
| SC8                                         | Data analysis and statistical output                                                                                                | 3               | Credit             |

|                                                |                                                                             |      |        |
|------------------------------------------------|-----------------------------------------------------------------------------|------|--------|
| SC9                                            | Expert technology for system decision support                               | 4,5  | Credit |
| SC10                                           | Visualization of data                                                       | 4,5  | Credit |
| SC11                                           | Modern architectures and programming tools for multimedia computing systems | 4,5  | Credit |
| SC12                                           | Basics of software testing                                                  | 4,5  | Credit |
| SC13                                           | Research and design of specialized computer systems                         | 3    | Credit |
| SC14                                           | Basics of WEB UI development                                                | 3    | Credit |
| SC15                                           | Automated control systems for technological processes                       | 4,5  | Credit |
| SC16                                           | Digital communications in the global space                                  | 4,5  | Credit |
| Total amount of selective components:          |                                                                             | 28,5 |        |
| Practical training                             |                                                                             |      |        |
| PT1                                            | Scientific and pedagogical practice                                         | 9    | Credit |
| PT2                                            | Pedagogical practice                                                        | 9    | Credit |
| PT3                                            | Technological practice                                                      | 7,5  | Credit |
| PT4                                            | State certification                                                         | 3    | Exam   |
| Total amount of practical training components: |                                                                             | 28,5 |        |
| GENERAL AMOUNT OF EDUCATIONAL PROGRAM          |                                                                             | 90   |        |

### 3. Form of certification of higher education applicants

Certification of graduates of the educational program of the specialty 015.10 "Professional education (Computer technologies)" is carried out in the form of defense of the qualification master's work and ends with the issuance of the standard certificate of awarding a master's degree in specialty 01 Education / Pedagogy 015.10 Professional education (Computer technologies) with qualification «Specialist in the field of computer technologies, disciplines in the field of computer technologies».

The certification is carried out openly and publicly.